PR-NET-OSM-072

USE OF LOW VOLTAGE MOBILE GENERATORS

OPERATIONAL SAFETY MANUAL – SECTION 11.1

Scottish & Southern Electricity Networks

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1 Introduction

1.1 This document details the **Approved** Procedure for the temporary connection and use of **Low Voltage Mobile** and **Portable Generators** connected to the Scottish and Southern Electricity Networks (**SSEN-D**) Distribution **System**.

1.2 Adopting a common approach to the use of **Low Voltage Mobile** and **Portable Generators** will assist in the safe and efficient transfer of Generators and operators between all parts of the Company, particularly in emergencies.

1.3 It should be noted that there will be circumstances where the use of **Low Voltage Mobile** or **Portable Generators** is not practicable due either to operational or safety grounds.

2 Scope

2.1 The scope of this document relates to the temporary connection and use of the following types of **Low Voltage Portable Generators**, which are under **SSEN-D**'s control, whether owned by **SSEN-D**, or hired by **SSEN-D**:

- Small standalone **Low Voltage Portable Generators**, which provide a supply to the customer via a socket outlet
- **Mobile Low Voltage Generators**

2.2 It applies to situations where **Mobile** or **Portable Generators** are required to:

- Operate in parallel with the Distribution **System** or to operate as a stand-alone unit.
- Provide temporary **Low Voltage** supplies to one or more customers or for **System** support

2.3 The scope of this document does not apply to:

- Permanently connected **Generators**
- Customer owned **Generators**
- **High Voltage Generators** (See PR-NET-OSM-073 Use of High Voltage Mobile Generators - Operational Safety Manual - Section 11.2).

3 References

The documents detailed in Table 3.1 - Scottish and Southern Electricity Networks Documents, and Table 3.2 - External Documents, should be used in conjunction with this document.

Table 3.1 - Scottish and Southern Electricity Networks Documents

Reference	Title
PR-NET-OSM-006	SSEN Distribution Operational Safety Rules – Operational Safety Manual – Section 1.1
PR-NET-OSM-028	Switching Terminology and Approved Abbreviations - Operational Safety Manual - Section 4.4
FO-NET-OPS-056	Mobile Generators: Connection / Disconnection and Environmental Risk Assessment
FO-NET-OPS-062	Form of Consent for Temporary Siting of Mobile Generator-Substation
WI-NET-OSM-002	Personal Protective Equipment and Workwear for Live Environments
TG-NET-CAB-017	Low Voltage Work Element Processes for Joint Assembly Instructions
WI-NET-CAB-078	Low Voltage Temporary Generator Connection to PILC Cable
WI-NET-CAB-079	Low Voltage Temporary Generator Connection to CONSAC Cable – Assembly Instruction

WI-NET-CAB-080	Low Voltage Temporary Generator Connection to 4-Core Wavecon Cable - Assembly Instruction
WI-NET-CAB-081	Low Voltage Temporary Generator Connection to 3-Core Wavecon Cable - Assembly Instruction
PR-NET-OCS-006	Carriage of Dangerous Goods – Networks
N/A	SSEN SHE Handbook (Held in Safety, Health and Wellbeing SharePoint Site)

Table 3.2 - External Documents

Reference	Title
NRSWA	New Roads and Street Works Act (as amended)
BS 7071	Specification for portable residual current devices
BS EN 61008	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses

4 Definitions

4.1 The words printed in bold text within this document are either headings or definitions. Definitions used within this **Approved** Procedure are defined within the list presented immediately below, or within section 2 of the **Operational Safety Rules**.

4.2 **Generator**

A term describing a prime mover (normally a diesel engine) coupled to an AC Alternator which converts mechanical power into electrical power.

NOTE: The term '**Generator**' and '**Mobile** or **Portable Generator'** are interchangeable in this **Approved** Procedure.

4.3 **Hybrid Generator**

A **Generator** with provision to store energy in the form of a battery and to provide a **Low Voltage** supply from that battery.

4.4 **Operational Safety Rules (OSR)**

The **SSEN-D** Distribution set of rules, as read with related documents and procedures, that provide generic safe systems of work on the **System** therefore ensuring the health and safety of all who are liable to be affected by any **Danger** that might arise from the **System**.

4.5 **Mobile Generator**

A transportable **Generator** for temporary connection to the **System.**

4.6 **Protection**

Function, device, or equipment for automatically detecting fault conditions and for initiating operation of **Apparatus** to disconnect the fault conditions.

4.7 **Portable Generator**

Small **Generator** for supplying small single-phase loads.

NOTE: These are commonly referred to as a 'suitcase' **Generator** within **SSEN-D**.

4.8 **Synchronise**

The act of synchronising the output of a **Mobile Generator** to match the **System** followed by the closing of the circuit breaker to enable both **Systems** to operate in parallel in order for the **Generator** to pick up load prior to the normal supply being disconnected.

5 General Responsibilities

5.1 Persons who are required to operate and undertake work on the **System Shall** have a thorough understanding of the work and ensure on-site risks are suitably assessed and appropriate control measures put in place before, during and after all activities.

5.2 Persons **Shall** ensure that at all times during the work (or associated testing) **General Safety** arrangements are maintained and that other work areas are not adversely affected by the activities for which they are responsible.

6 Authorisation

6.1 It **Shall** be the responsibility of the individual to ensure that any actions performed are within the bounds of their competency and authorisation level.

6.2 Competence and authorisation certificates **Shall** be retained personally and be made available upon request.

6.3 **Generators Shall** only be connected, disconnected or operated by suitably **Authorised Persons**, including staff or contractors, who have the specific authorisation to do so as indicated on their Certificate of Operational Authorisation.

6.4 Prior to authorisation, persons must have completed **Approved** training related to the connection, operation (including **Synchronisation**, where relevant), and disconnection of **Generators** to the Distribution **System** and have received training in the operation of the specific type(s) of **Generator** they are to be Authorised to connect.

6.5 There are 4 levels of authorisation for **Generators**:

1. **Low Voltage Dead** Operation / Connection.
2. **Low Voltage Live** and **Dead** Operation / Connection.
3. **High Voltage Dead** Operation / Connection.
4. **High Voltage Live** and **Dead** Operation / Connection

6.6 Where necessary, advice on the minimum pre-qualifications for authorisation may be sought from the Operational Safety Team.

NOTE: **Approved** training courses have been developed which cover all aspects necessary for the safe and effective operation of **Generators** and associated equipment.

6.7 The connection and operation of a **Generator** in a Synchronising activity **Shall** require the **Authorised Person** to be Authorised for '**Live** Operation / Connection' of **Generators**.

6.8 Where the **Authorised Person** is unfamiliar with the connection and operation of a particular type of **Generator**, they **Shall** arrange for a suitably competent person, which may including technicians from the **Generator** hire company, to attend site and provide advice on operating the **Generator** and its synchronising equipment.

7 Personal Protective Equipment

7.1 Persons who are required to work or carry out **Switching** on or near the **System Shall** wear suitably **Approved** Personal Protective Equipment (PPE). Furthermore, where warning labels or signs identify the existence of a particular hazard, additional and appropriate PPE **Shall** be worn.

7.2 As a minimum, PPE **Shall** meet the requirements of WI-NET-OSM-002.

8 General Requirements

8.1 Quality of Supply

8.1.1 **Generators Shall** be able to support the load they are required to supply and to maintain the supply voltage and frequency within the statutory limits:

- **Low Voltage**: 230V / 400V + 10% / -6%
- Frequency: 50Hz ± 1%

NOTE: The statutory limits for voltage and frequency are specified in the Electricity Safety Quality Continuity Regulations 2002 (as amended).

8.2 Generator Siting and SHE Considerations

8.2.1 All connections and disconnections of Generators to **SSEN-D Systems Shall** be carried out in accordance with:

- **SSEN-D**'s **OSR**
- **SSEN-D**'s Occupational Safety Manual, Occupational Health Manual and Environmental Manual

NOTE: The requirements in this **Approved** Procedure address relevant statutory requirements for Generators stated in The Electricity at Work Regulations 1989 (as amended) and The Electricity Safety, Quality and Continuity Regulations 2002 (as amended).

8.2.2 A **Generator Shall** be deemed to be part of the Distribution **System**, at the time isolation is applied to the **Generato**r. This **Shall** be immediately prior to the first cable connection, normally the **Earth**, being made to the Distribution **System**.

8.2.3 A Risk Assessment **Shall** be completed for each connection and disconnection of a **Generator**. This is to enable site hazards and necessary precautions to be identified, and to ensure safe connection and operation.

8.2.4 An Environmental Risk Assessment **Shall** also be completed for each **Generator** site to assess any possible environmental impact. This should be recorded on form FO-NET-OPS-056. This form also details the connection and disconnection procedures to be adhered to for **Low Voltage Systems**. The Environmental Risk Assessment **Shall** include details on refuelling the **Generator**, if this is applicable. Requirements for transporting fuel and refuelling **Generators** detailed in the **SSEN-D** Environmental Manual **Shall** be followed.

8.2.5 **Hybrid Generators** have stored energy in the form of a battery and can operate at **Low Voltage** whilst running on batteries (SILENT mode). Before connection/disconnection, the **Low Voltage** output **Shall** be **Isolated**.

8.2.6 The land owner's consent, if required, **Shall** be obtained before any **Generator** is sited. The details of any comments or conditions imposed by the land owner **Shall** be recorded on FO-NET-OPS-062. In the case of a **Generator** to be connected to restore supplies during a **System** fault, and where it has not been possible to obtain the land owner's consent prior to siting the **Generator**, then the land owner's consent **Shall** be obtained as soon as reasonably practicable thereafter.

8.2.7 All persons **Shall** use **Approved** tools, instruments, connectors and equipment for the connection/disconnection of a **Generator**.

8.2.8 When siting any **Generator**, account **Shall** be taken of access required by; **Generator** operators, pedestrians, road users including:

- Safe access for operators
- Access and egress for vehicles

- Any height, weight and width restrictions whilst siting **Generators**
- Off loading facilities

8.2.9 Due consideration **Shall** be given to ensuring the necessary **Working Clearance** from any nearby overhead lines.

8.2.10 **Generators** should be sited in locations where the risks of step and touch potential to members of the public are reduced.

8.2.11 **Generators** and their associated **Plant** and equipment **Shall** be positioned to avoid creating unnecessary hazards for staff and / or public. Where this is impractical, suitable control measures **Shall** be employed to prevent **Danger**, e.g. installing road plates to cover cables that could cause tripping etc.

8.2.12 Consideration should also be given to the effects of noise when siting **Generators** near hospitals, residential areas or other sensitive areas, particularly if **Generators** will run during the night.

8.2.13 **Hybrid Generators** should have their time settings activated for silent running during the night.

NOTE: The factory settings for silent running are between 23:00 hrs and 07:00 hrs, 7 days a week.

8.2.14 The use of **Generators** is classified as "Works" under the New Roads and Street Works Act (NRSWA) and appropriate street works notices, signing and guarding **Shall** be provided, as applicable.

8.2.15 **Generators Shall** be positioned on flat or level ground to maximise stability, useable fuel capacity and to ensure engine oil pick up. Generally, the maximum slope should not exceed 15°.

8.2.16 **Generators Shall** be positioned with sufficient room around the **Generator** to allow operation, refuelling and erection of any security fencing. Any vents **Shall** be kept clear of debris, in particular for **Hybrid Generators**.

8.2.17 Prior to connecting or starting a **Low Voltage Generator**, delimiting and or supervision should be arranged such that the general public and all non-essential staff are kept clear of any part of the **Generator**, **Low Voltage** leads, **Earth** connections, **Earth** spikes, etc.

8.2.18 When selecting a site for a **Generator**, the following issues **Shall** be considered and, if necessary, control measures **Shall** be recorded in FO-NET-OPS-056:

- Size/rated power output of **Generator** required
- Ease of access for **Plant**, equipment and any delimiting
- Noise consideration in residential areas, e.g. use of **Hybrid Generator**
- Connection arrangements
- Arrangements for limiting unauthorised access
- Availability of a suitable **Earth**, or the practicalities of establishing any temporary earthing

8.2.19 If a **Generator** is to be left connected and unattended while in operation, i.e. either running or energised at **Low Voltage**, then a Risk Assessment **Shall** be carried out to determine the hazards and **Dangers** of the site and whether an operator must remain on-site during running. The following list gives situations where an operator could be required to remain on site:

- When the **Generator** leads are connected to the **Low Voltage** Distribution **System** in such a manner that the **Low Voltage** connection point or terminations cannot be secured and enclosed in a safe manner

- When the connection of the **Generator** leads to the **Low Voltage** Distribution **System** would present a greater **Danger** or increased risk to any person entering the substation, whether Authorised to do so or not
- When the **Generator** is being used in a location where there is a likelihood of vandalism or theft, especially if it is a **Hybrid Generator** running on batteries (Silent Mode)
- Where the presence of the **Generator** would create a significant safety risk to the general public if not attended

This list is not exhaustive and there could be other situations, where an operator could be required to remain on site.

8.2.20 Any **Generator** that is to be left unattended **Shall** be inspected at least once in every 24-hour period to ensure that any problems that could occur with the **Generator**, such as fuel leaks or vandalism, are detected as soon as is reasonably practicable. If the **Generator** requires refuelling within the 24-hour period, no additional inspection is required. The inspection **Shall** include a check of all connections, both to **Earth** and the **System**, and to check for any external fuel leaks.

8.3 Procedures, Documents and Records

8.3.1 The following procedures **Shall** be kept with a **Generator** and be available to any operator.

- An operating procedure, which **Shall** include pre-start checks, starting instructions, synchronising instructions (if necessary), running checks, stopping instructions and use of the emergency stop facility. These procedures will not be controlled documents, but **Shall** be updated as necessary if changes are made to the operation or controls on the **Generator**

8.3.2 The following documents and records **Shall** be kept:

- A log detailing the number of hours run
- A simple line diagram of the unit showing all switchgear, fuses and points of isolation (where fitted). If it is deemed necessary to avoid **Danger** and facilitate the safe use of the **Generator**, the diagram **Shall** be kept with the **Generator**
- A maintenance log sheet, which should also include details of cable repairs and testing
- Date of the last safety test of the **Generator**
- Date and details of the last Protection test of the **Generator**

8.3.3 Details of the procedures, documents and records required for hired **Generators** are contained within the **SSEN-D** Procurement Team document, TS-242, Section 4.

9 Connection and Operation of Generators

9.1 Generator Leads and Connectors

9.1.1 Prior to use, all **Generator** leads and connectors **Shall** be examined for any defects. Any lead or connector found to be defective **Shall** not be used until a permanent repair has been carried out.

9.1.2 Multi-core cables **Shall** be phase identified and **Shall** be visually examined and tested to verify their phasing and physical integrity prior to connection.

9.1.3 Leads **Shall** not be run through metal fences or tied together using metal cable ties.

9.1.4 **Generator** leads **Shall** be removed from drums, uncoiled and neatly laid out to avoid undue heating and loops in the cable run.

9.1.5 All **Generator** leads **Shall** be protected from mechanical damage and supported as necessary. Any cables laid in the public highway or an area accessible to the general public **Shall** be suitably protected with covers etc. to prevent **Danger** to the public and operators.

9.1.6 Notices **Shall** be fitted to highlight silent running mode.

9.1.7 Power Lock connectors **Shall**, where reasonably practicable, be used as they provide a quick and safer means to connect **Generators**. To prevent **Danger**, Power Lock connectors **Shall**:

- Be prevented from being immersed in water
- Not be dropped or dragged across hard surfaces
- Be fitted with suitable dust caps when not in use
- Not be put under tension and, in particular, **Shall** not be connected together when being reeled in
- Not be made together or broken when carrying load

CAUTION: Generator leads can be **Live** both from the **Generator** and from the **System**.

9.1.8 Larger **Mobile Generators**, typically those with a rated power of 500kVA and above, should be connected using all the multiple **Generator** leads per phase, which are supplied with the **Generator**, to supply its rated power output. Only in exceptional circumstances, where it is not practicable to use all **Generator** leads, may less than the supplied number per phase be used. In this case, the **Generator** output should be suitably down rated to avoid overloading the **Generator** leads and advice should be sought regarding alteration of overload and **Protection** settings.

9.1.9 Care **Shall** be taken not to cross **Generator** leads from different phases. The colour coding at both ends of each **Generator** lead **Shall** be the same and **Shall** be verified prior to use.

NOTE: Colour coding of **Generator** leads assists in prevention of crossing any leads.

CAUTION: When connecting to, or disconnecting from, a **Live System**, the other leads will be **Live** by virtue of the first connected, or any that remain connected.

9.2 Connection at Substations

9.2.1 **Generators Shall** be connected and **Earthed** at substations in accordance with Appendix A.

NOTE: This arrangement will result in neutral current flowing in both the **Generator** neutral and **Earth Conductors**.

9.2.2 In some circumstances, it could be necessary to remove the lower outer panels and inner mesh guards from transformer **Low Voltage** cabinets and **Low Voltage** pillars to allow access to the neutral bar to connect the Power Lock type neutral and **Earth** connectors. This is especially the case for fully shrouded **Low Voltage** cabinets and **Low Voltage** pillars. A Risk Assessment **Shall** be carried out prior to removing any such panels/guards. The Risk Assessment should include checks to ensure that no **Live** parts extend below the shrouding that will remain in place into the area where the panels/guards etc. will be removed and that there will be no **Danger** of any exposed metal part of the **Low Voltage** cabinet/pillar, where panel/guards have been removed from coming in contact with any **Live** parts.

9.2.3 The removal of panels/guards from **Low Voltage** cabinets/pillars is not classified as **Live** working - as there will be no manipulation of any **Live Conductors**. However, full **Live** working PPE **Shall** be worn and insulated tools **Shall** be used for the removal of the panels/guards and the installation of the connections.

9.2.4 Where practicable, connections to **Low Voltage** cabinets/pillars **Shall** be made so that the doors can be closed and locked. If it is not practicable, the **Low Voltage** cabinet/pillar **Shall** be covered and secured to ensure it is weatherproof and to prevent unauthorised access.

NOTE: Purpose made covers are available for this.

9.2.5 Where a Risk Assessment deems it necessary, arrangements **Shall** be made for the installation to be permanently attended whilst the **Generator** connections are in place (see 8.2.19).

9.2.6 Once a transformer **Low Voltage** disconnector has been opened, a **Generator** will slip or lose synchronism with the normal **System** such that a phase difference will exist across the gap. The same conditions will develop when pole-mounted fuses are removed to break the parallel between the **Generator** and the **System**. Transformer **Low Voltage** disconnectors are only capable of being opened or closed when making and breaking negligible current or when no significant voltage is present. It is essential that any **Synchronising** system is capable of ensuring the **Generator** remains **Synchronised** with the **System** when these disconnectors are being opened or closed.

9.3 Connecting into Pole Mounted Low Voltage Fuse Holders

9.3.1 **Generators Shall** be connected and **Earthed** at pole-mounted **Low Voltage** fuse holders in accordance with Appendix A.

9.3.2 When connecting into pole-mounted **Low Voltage** fuse holders, Power Lock fuse carriers **Shall** be fitted with a dummy fuse. Standard fuses **Shall** not be used in Power Lock fuse carriers connected to pole-mounted **Low Voltage** fuse holders under any circumstances.

NOTE: When using dummy fuses, they **Shall** be cleaned and their insulation resistance tested prior to use, to ensure they are in a serviceable condition.

9.3.3 A further check **Shall** be carried out to ensure the correct insertion of the Power Lock fuse carrier into the pole mounted **Low Voltage** fuse holder so that the **Generator** is connected to the outgoing side of the fuse holder.

NOTE: This is to avoid the connection of the **Generator** to the **System** side of the fuse holder.

CAUTION: Failure to use dummy fuses, or failing to check that the **Generator** connection is on the out-going side of the fuse holder, can result in the **High Voltage System** being back-fed from the **Generator**.

9.4 Connection to Low Voltage Mains and Services

9.4.1 Small **Low Voltage Generators** may be connected to an isolated section of **Low Voltage** mains or to individual customers, as detailed in section 9, for example to restore supply after **Low Voltage** faults.

9.4.2 Connection to customer service positions may be made by running temporary service cables either from small individual **Low Voltage Portable Generators** or from larger **Low Voltage Mobile Generators** using a suitable distribution unit.

NOTE: Some **Low Voltage Generators** are fitted with a distribution board with Residual Current Device (RCD) controlled service connections. Freestanding versions of these boards are also available.

9.4.3 Connections to customer service positions should consider the typical arrangements shown in Appendix A.

NOTE: RCDs are needed where shown in to improve safety and to avoid the need to measure and reduce the value of the neutral **Earth** impedance to statutory values.

9.4.4 Where a larger number of customers are off-supply and connection can be made to an **Isolated** section of **Low Voltage** mains, then the **Generator** leads may be temporarily jointed to the **Low Voltage** mains cable, providing they are suitably insulated and protected in accordance with the procedures contained within TG-NET-CAB-017 - Basic Temporary **Low Voltage** Generator Connections.

9.5 Connection of Hybrid Generators

The **Hybrid Generator Shall** be transported with a full state of charge. This will retain energy to and from locations. In the event of the battery terminals becoming exposed and unsafe to secure, a load bank **Shall** be connected to discharge the battery pack to its lowest possible state of charge before attempting to secure any connections.

9.6 Connection Sequence

9.6.1 **Generator** leads **Shall** be connected to the generator and then to the **System** in the sequence, **Earth**, Neutral, phases.

9.6.2 Prior to closing any transformer **Low Voltage** disconnector/link when carrying out a Sync Off operation, the operator **Shall** measure the voltage across the disconnector gap and ensure it is less than 30 V.

9.6.3 At disconnectors and any open points on the **Low Voltage System**, warning notices should be fitted indicating that a non-phasing point exists.

9.7 Earthing Connections

9.7.1 Correct earthing is essential to ensure the safe operation of **Generators**. If it is not possible to obtain a suitable **Earth** for a **Generator**, then the **Generator Shall** not be connected.

9.7.2 Separate **High Voltage System Earths Shall** not be used as an **Earth** for a **Low Voltage Generator**. The staff on site are responsible for making the final decision as to whether a **Generator** is connected to the **System** or not.

9.7.3 In most cases it will be possible and acceptable to use an existing **System Earth** for **Earthing** of a **Generator**. However, if the Generator is being used to supply customers due to the unavailability of part of the normal Distribution **System**, there could be a risk that the **Earthing** of that part of the **System** to be supplied by the **Generator** could have been disturbed. In such cases either temporary **Earthing** should be installed to ensure the **Generator** is suitably **Earthed** or an RCD should be installed to provide adequate **Earth** fault **Protection**.

9.7.4 Detailed earthing arrangements necessary for **Low Voltage Generators** are contained in section 10.3, including:

- The correct neutral **Earth** impedance value
- When the neutral **Earth** impedance can be assumed or when it must be measured

9.7.5 All **Generators Shall** have separate neutral and **Earth Conductors**. The use of a combined neutral / **Earth Conductor** is deemed unsafe due to the risk that can arise if this single **Conductor** fails. As the **Earth Conductor** will form a parallel path with the neutral **Conductor** it should have an appropriate current carrying capacity. A 'token' **Earth** electrode **Shall** not be used as a substitute for this separate **Earth Conductor** as it could give rise to **Danger**.

9.7.6 Prior to connecting **Generators** to the **System**, the type of **System Earthing Shall** be correctly identified and the **Earth** connection to the **Generator Shall** be of the same type to ensure the **Generator** is connected correctly to it.

9.8 Protection

9.8.1 Where a **Generator** is connected in the absence of a normal **System** supply it **Shall** be equipped with **Protection** to ensure, so far as reasonably practicable, that the **System** voltage and frequency are maintained within statutory limits (see 8.1.1).

9.8.2 The **Generator Shall** also be equipped with **Protection** that disconnects the **Generator** in the event of a fault occurring in the **System** being supplied.

9.8.3 As a minimum, **Generators** should be equipped with the **Protection** required for **Generators** as detailed in Table 9.1 of this **Approved** Procedure. All **Generators** connected to **SSEN-D**'s **Low Voltage System Shall** be fitted with **Protection** which meets these minimum requirements.

9.8.4 Where a **Generator** is only intended to operate in parallel with the **System** whilst load is being transferred from the **System** to the **Generator**, then no additional **Protection** is required. However, **System** operating procedures **Shall** ensure that the transfer is completed within the shortest practicable time.

9.8.5 Any **Generator** required to operate in parallel with the **System** for a sustained period shall be equipped with:

- Loss of mains **Protection** complying with Engineering Recommendation G59 or G99 as appropriate
- Over-excitation **Protection** to prevent excessive heating of the alternator (specified under the terms & conditions of generator supply contracts through **SSEN-D** Procurement process)

9.8.6 All **Generator Protection Shall** be subjected to routine testing at least once every two years, to ensure that it continues to operate within specification. Records **Shall** be kept of any routine **Protection** testing.

9.8.7 Prior to supplying customers from any **Generator**, a functional test of the **Protection** system(s) and related equipment should be carried out when at site. The functional test **Shall** include manual operation of the trip or emergency stop button to confirm correct operation.

Table 9.1 - Protection Requirements for Portable Generators Supplying Distribution Networks

RECOMMENDED PROTECTION	MODE OF OPERATION						SUGGESTED SETTINGS (Note 1) * Main Protection Requirements
	INDEPENDENT OR TRANSFER PARALLEL			PARALLEL WITH NETWORK			
	Portable Generating Set	LV Generation set	Step-up Unit	Portable Generating Set	LV Generation set	Step-up Unit	
Residual Current Device	*			N/A			30mA
Overvoltage		*	*	N/A	*	*	253V, 5 s (Max. setting 253V. Max. 8 s)
Undervoltage		*	*	N/A	*	*	216V, 5 s (Min. setting 216V. Max. 8 s)
Overfrequency		*	*	N/A	*	*	50.5Hz, 5 s (Max. setting 57.5Hz. Max. 8 s)
Underfrequency		*	*	N/A	*	*	49.5Hz, 5 s (Min. setting 42.5Hz. Max. 8 s)
G99 Overvoltage				N/A	*	*	262V, 0.5 s (Note 2)
G99 Undervoltage				N/A	*	*	207V, 0.5 s (Note 2)
G99 Overfrequency				N/A	*	*	50.5Hz, 0.5 s
G99 Underfrequency				N/A	*	*	47Hz, 0.5 s
G99 Loss-of-mains				N/A	*	*	1.0Hz/s, time delay 0.5s (Note 3)
LV Overcurrent	*	*	*	N/A	*	*	1.2 x FLC, Thermal: 7xFLC, Inst. (Note 4)
HV Overcurrent			*	N/A		*	1.3 x FLC, 0.2TM (Note 5)
LV Earth Fault			*	N/A		*	0.75 x FLC, 3 s
HV Earth Fault			*	N/A		*	0.3 x FLC, Inst.
NVD (Note 6)			*	N/A	*	*	30V, 0.125TM (Note 7)
Reverse power (if fitted)		*		N/A	*		10% - 15% of rated power (Note 8)

NOTE 1: In some instances, it may be necessary to employ a setting other than the suggested setting (e.g. in order to avoid nuisance tripping) or to take account of different network configurations. In all cases the setting should not exceed the limits shown.
NOTE 2: These settings are based on 230V nominal with +14% and -10%. It should be remembered that G99 [N17] protection is not provided in order to maintain statutory voltage limits.
NOTE 3: The RoCoF settings are a balance between the need to detect genuine conditions and the risk of unnecessary operation for the system conditions anticipated in the future from changes in the generation mix connected to DNO networks.
NOTE 4: Inst value based on data in ENA EREC Table D1. Brushless alternators may supply lower short circuit currents and a value of 3 x FLC, may be more appropriate for such units.
NOTE 5: The time multiplier of 0.2 is based on the use of a relay with a “standard inverse” characteristic.
NOTE 6: Neutral Voltage Displacement (NVD) protection required where high impedance earthing is employed, or where specified by the user.
NOTE 7: The setting of 30V is based on the use of 11 000/110/63.5V VT with an open delta tertiary winding and an 11kV network protected by 30A fuses and EIDMT relay.
NOTE 8: Refer to Clause 5.5 for more information.

10 Connection of Small Portable Generators (Less than 10kVA)

10.1 General

10.1.1 This section details the connection of small single-phase **Portable Generators** to a single customer's installation, or part of an installation, which has been **Isolated** from the normal Distribution **System**. Typically, the connection will be made at the customer's supply terminals (see Appendix A). This section also details the provision of a trailing lead with a 13A socket for situations where the connection of a **Generator** to the customer's supply terminals is not reasonably practicable.

10.1.2 As the **Generators** used in these situations cannot usually supply the customer's entire load, due to their limited size, and because they have no provision for frequency control, customers must be informed of the load limitation of these **Generators**, as detailed below.

10.2 Specification of Small Portable Generators and Post Connection Checks

10.2.1 Small **Portable Generators** used to supply single customer installations or provide a trailing lead **Shall** be fitted with a 30mA Residual Current Device (RCD), either within the machine or as a separate unit.

10.2.2 The leads used to connect the **Portable Generator** to the customer's installation should be of the 3-core, double insulated type and should be suitably rated to match the **Portable Generator's** rated output.

10.2.3 The leads should be routed and protected as necessary to minimise the risk of mechanical damage and tripping hazard. In cases where concentric cable is used as the connection between the **Portable Generator** and the customer, only split concentric **Shall** be used, regardless of whether the **Earthing System** in use Combined Neutral Earth (CNE) or Separate Neutral Earth (SNE) is.

10.2.4 After connection of the **Portable Generator** leads at the customer's installation, and with the customer's incoming main switch tuned off, the polarity and **Earth** loop impedance of the supply from the **Generator Shall** be checked and the RCD **Shall** be tested for correct operation (i.e. manual operation of the trip button).

10.2.5 Where the **Portable Generator** is connected at the customer's supply terminals the phase and neutral from the **System Shall** be disconnected to provide isolation from the **Low Voltage System.**

10.2.6 Appendix A shows typical arrangements.

10.3 Earthing of Portable Generators

10.3.1 **Portable Generators Shall** be connected to an **Earth** electrode to which all extraneous metalwork must be connected (unless otherwise stated in an **Approved** procedure). The main customer **Earthing** connection of the installation **Shall** be removed from the cut-out or earthing terminal block and temporarily connected to this electrode using 16mm^2 Cu or equivalent **Conductor.**

10.3.2 In order to ensure the correct operation of the **Portable Generator's** RCD, when connecting to a CNE **System**, there should be no connection between the **Portable Generators Earth** electrode and the neutral **Earth** terminal at the cut-out. Care should be exercised to ensure that following removal of the **Portable Generator**, all connections from the **System** to the customer's installation are remade correctly and the polarity and **Earth** loop impedance checked.

10.3.3 The **Earth** resistance of an **Earth** fault electrode for a **Portable Generator Shall** be a maximum value of 1,600Ω to ensure that, under fault conditions, the **Portable Generator** supply is disconnected before the potential on any extraneous metalwork reaches 50V. Other than as given below, this **Earth** resistance value **Shall** be measured prior to the customer being supplied from the **Portable Generator**.

NOTE: Tests show that, for average soil conditions, 3 **Earth** spikes connected in a straight line, 1 metre apart and driven 600 mm into the ground, will give a suitable **Earth** value. Providing the **Earth** electrode is installed in this manner, no measurement is required.

10.3.4 For CNE installations where outbuildings are supplied by a TT system, (where the customer provides their own **Earth** fault Protection), already protected by a 30mA RCD, the combined **Earth** loop impedance (including the out-building electrode and the Small **Portable Generator Earth** electrode) **Shall** be measured and **Shall** not exceed 1,600Ω. In this case, that part of the installation may be supplied from the Small **Portable Generator**.

10.3.5 The **Earth** electrode for the Small **Portable Generator Shall** be installed in such a manner that it does not unduly present a tripping hazard.

10.4 Protection of Small Portable Generators

10.4.1 All Small **Portable Generators Shall** have the following **Protection** fitted:

- Overload (MCB) – matched to the rated power output of the **Generator**
- Residual Current Device (RCD) – 30mA, conforming to BS 7071 and BS EN 61008

10.4.2 In addition, it is recommended that indications of the following are provided:

- Voltage
- Frequency
- Load in amps (A) or kilowatts (kW)

10.5 Customer Information

10.5.1 Customers provided with a supply from **Portable Generators Shall** be briefed on the following information:

- Emergency procedures
- Emergency contact numbers
- Security of temporary leads and avoidance of tripping
- Advice on the load which can be connected. For example: limited lighting, small kettle, central heating controller and pumps, television, radio and other small power appliances
- Advice on the load which cannot be connected. For example: electric water and storage heating, electric cooker, microwave oven and electric shower
- Advice on the use of appliances fitted with an electric clock
- Access arrangements for refuelling, by **SSEN-D** and removal by **SSEN-D** on completion of work

10.5.2 Where necessary, MCBs/fuses supplying unauthorised load should be opened/removed to prevent use whilst the **Portable Generator** is connected to the customer's installation.

10.5.3 This information should be supplied to the customer on a laminated instruction sheet. Operators installing **Portable Generators Shall** ensure that customers are aware and understand the limitations which can exist.

10.5.4 An oil spill response kit should be left on site with the Small **Portable Generator**, where such a control measure is identified in the environmental Risk Assessment.

11 Connection of Mobile Generators to Supply Individual Customers or an Islanded Section of Low Voltage System

11.1 General

11.1.1 This section details situations where **Mobile Generators** are used to supply individual multiple single or three-phase supplies using **Generators** capable of supplying full-load and maintaining frequency.

11.1.2 Although the installations considered in this section will vary from individual single-phase domestic customers to three-phase commercial or industrial installations, the considerations to be made are similar to those detailed in the previous section.

11.1.3 This section further details the arrangements necessary to connect **Portable Generators** to a disconnected section of the **Low Voltage System**, e.g. a radial section of **Low Voltage** cable beyond a cable fault.

11.2 Phase Rotation

11.2.1 At three-phase installations the phase rotation **Shall** be checked, where practicable, prior to the disconnection of the normal supply and after the installation of the **Generator**, but before any three-phase equipment is used. If this is not practicable, then any three-phase equipment or three-phase customers **Shall** be **Isolated** and, with the **Generator** supply connected, the phase rotation **Shall** be checked within an installation prior to energising three-phase equipment or customers.

11.2.2 In some cases, typically with underground **Systems**, it might not be possible to isolate three-phase customers before the **Generator** supply is energised, or to check the phase rotation on the **System** at a suitable test point after it has been energised, due to a lack of access. In this case, the **Generator** may be connected to the **System**, but the **System Shall** not be energised until access can be made to check the rotation.

11.2.3 If found to be incorrect, the phase rotation **Shall** be corrected by altering the **Generator** connections; customer connections **Shall** not be altered.

11.2.4 For all connections to single customers, whether single-phase or three-phase and Isolated sections of the **Low Voltage System**, the polarity **Shall** be checked to ensure correct connection of the **Generator** supply.

11.3 Earthing

11.3.1 Where it has been or can be proved that the existing **Earthing** arrangements have not been and will not be disturbed by any work on the **System**, then the preferred option is to use the existing **System Earthing** arrangements.

11.3.2 It may be assumed that the **Earth** resistance value for an islanded section of **Low Voltage** cable is suitable if it meets either of the following criteria:

- More than 30m of PILC cable is in direct contact with **Earth**

- The **Low Voltage** cable neutral is **Earthed** by **Earth** electrodes in at least two other locations

11.3.3 The existing **System Earthing** arrangements **Shall** not be used where the service cable and/or main cable has a fault, or where there is any doubt as to the security of the **Earthing** arrangement. In this case one of the following actions **Shall** be carried out:

- Run a temporary **Earth** lead from the **Generator** back to an unaffected adjacent section of the **System**
- Connect the **Generator** to a new **System Earth** with an **Earth** resistance value of no more than 20Ω
- Use a suitably rated RCD installed with a suitable **Earth** electrode (See NOTE 1 and NOTE 2)

NOTE 1: To ensure the **Generator** is disconnected before any extraneous metalwork rises above 50V, an **Earth** electrode with an **Earth** resistance of 450Ω or less **Shall** be installed and the customer's **Earth** electrode and all extraneous metalwork **Shall** be connected to it.

NOTE 2: Other than as given below, this value **Shall** be measured prior to the customer being supplied from the **Generator**. Tests show that, for average soil conditions, 6 **Earth** spikes connected in a straight line, 1m apart and driven 600mm into the ground, will give a suitable **Earth** value. Providing the **Earth** electrode is installed in this manner, no measurement is required.

11.3.4 When supplying single customers from a **Mobile Generator**, unless the existing **Earth** is to be used, it **Shall** be necessary to supply the customer via a 100mA RCD.

11.3.5 No connection **Shall** be made between the neutral and the **Generator Earth** electrode external to the **Generator**.

11.3.6 Following removal of the **Generator**, all connections from the **System** to the customer's installation **Shall** be remade correctly and the polarity and **Earth** loop impedance **Shall** be checked, in the case of a three-phase supply the phase rotation **Shall** also be checked.

11.3.7 Most **SSEN-D Generators** have been installed with switched three-phase 100mA RCDs, however if these are unavailable, plug in RCDs and distribution boards with single-phase 100mA RCDs should be used.

11.4 Connection to Mains Cables

11.4.1 Power Lock connectors **Shall** be used, wherever possible, to connect **Generators** to mains cables.

NOTE: Power Lock connectors permit the use of existing cables without the need to remove the cable end connectors.

11.4.2 At the location where the **Generator** cable is connected to the mains cable an **Earth** electrode **Shall** be installed and the cable connectors at the connection point **Shall** be suitably insulated and protected in accordance with the procedures contained TG-NET-CAB-017.

11.4.3 The connections to be made for CNE and SNE mains cables are illustrated in **the Low Voltage** Jointing Manual, see documents WI-NET-CAB-078/ WI-NET-CAB-079/ WI-NET-CAB-080/ WI-NET-CAB-081.

11.5 Running Two or More Generators in Parallel

11.5.1 If two or more **Generators** are to be run in parallel to supply individual customers or an islanded section of **System**, specialist advice should be sought from the Mobile Generation section.

11.5.2 Multiple **Generators** to be run in parallel **Shall** only be run in one of the following configurations.

- Each **Generator Shall** have load sharing equipment fitted, or
- One **Generator Shall** be run in isochronous mode and the other(s) in droop mode

12 Use of Single Mobile Generators to Supply or Run in Parallel with a Low Voltage System

12.1 General

12.1.1 This section details situations where **Mobile Generators** are used to supply **Low Voltage Systems**, which are normally supplied from Distribution substations, or running in parallel with a **Low Voltage System**. For example: providing voltage supporting; using **Generators** capable of supplying full-load and maintaining frequency.

12.1.2 Wherever possible, the Generator should be positioned adjacent to the connection point on the **Low Voltage System** to keep the **Generator** leads to a minimum length and to enable use of the existing **Low Voltage Earth** at the Distribution substation.

12.1.3 Under no circumstances **Shall** a **Low Voltage Generator** be used to back-feed a **High Voltage System** through a connection on the **Low Voltage System** as this could result in the **Generator** supplying an unearthed **High Voltage System**.

12.2 Earthing

12.2.1 When connecting a **Generator** to a **Low Voltage System** the operator **Shall** identify the **Earthing System** in use and whether the **Low Voltage** and **High Voltage Earths** are combined or segregated.

12.2.2 The connection of a **Generator** at a Distribution substation **Shall** not alter the existing **Earthing** arrangements. If the **High Voltage** and **Low Voltage System Earths** are segregated, the connection of the **Generator Shall** be connected to the **Low Voltage Earth** and **Shall** not make a connection between the two **Earth Systems**.

12.2.3 A **Generator Low Voltage Earth Shall** not be connected to a **High Voltage System Earth**. This does not preclude the connection of a **Generator Low Voltage Earth** to a combined **Low Voltage** / **High Voltage Earth**, where the combined **Earth** resistance value is less than 1Ω.

CAUTION: Failure to ensure the correct connection of the **Generator Earth** could cause dangerous rises in potential on extraneous metalwork due to transfer potential in the event of an **Earth** fault on the **High Voltage System**

12.2.4 Similarly, the Generator Low Voltage neutral connection **Shall** only be made to the Distribution substation **Low Voltage** neutral.

CAUTION: Failure to ensure the correct connection of the **Generator** neutral could result in high volts due to displacement of the neutral which might result in damage to customer property supplied from the **Generator**.

12.2.5 If it can be confirmed that the normal earthing arrangements at the installation(s) have not been, or will not be, compromised by work on the **System**, then the preferred option will be to use the existing **Earth**. This, however, might not be possible.

12.2.6 If the existing substation **Earth** can be used and is not likely to be disturbed by the work, then no test is necessary to check the **Earth** resistance value and it may be assumed that the **Earth** is suitable. If there is obvious or suspected evidence of damage to any earthing near the substation, the **Earth** resistance value **Shall** be checked prior to connection of the **Generator**. This requirement applies both to ground-mounted and pole-mounted substations. If the existing substation **Earth** cannot be used, or is likely to be disturbed or disconnected by the work, then either:

- a temporary **Earth** electrode of a maximum **Earth** resistance of 20Ω should be installed and used, or
- a temporary **Earth** lead should be run back to an unaffected adjacent section of the **System**
- use a suitable **Earth** electrode (See NOTE 1 and NOTE 2)

NOTE 1: To ensure the **Generator** is disconnected before any extraneous metalwork rises above 50V, an **Earth** electrode with an **Earth** resistance of 450Ω or less **Shall** be installed and the customer's **Earth** electrode and all extraneous metalwork **Shall** be connected to it.

NOTE 2: Other than as given below, this value **Shall** be measured prior to the customer being supplied from the **Generator**. Tests show that, for average soil conditions, 6 **Earth** spikes connected in a straight line, 1m apart and driven 600mm into the ground, will give a suitable **Earth** value. Providing the **Earth** electrode is installed in this manner, no measurement is required.

12.3 Protection

Where it is necessary to temporarily switch off any G59 or G99 **Protection** fitted to the **Generator**, e.g. to enable the **Generator** to **Synchronise** with the **System**, the G59 or G99 **Protection Shall** be switched back into service either once the **Generator** is supplying the **System** or when it is running in parallel.

12.4 Phase Rotation

For **Live** synchronised connection to a three-phase **System**, **Generators** should be fitted with three-phase "check sync" equipment to detect and prevent the **Low Voltage** circuit-breaker being closed, where the phase rotation on the **Generator** is different to that on the **Low Voltage System**. Where applicable, the operating procedures / instructions for **Generators shall** ensure that the phase rotation is checked on the **Generator** and **Low Voltage System** when connecting **Generators** to **Live Systems**.

12.5 Voltage and Frequency

When supplying an islanded **Low Voltage System**, once the **Generator** had been connected and the **System Live**, the frequency and voltage output from the **Generator Shall** be checked and adjusted to within the statutory limits (see section 8.1).

12.6 Supplying a Dead Low Voltage System

12.6.1 When using a **Generator** to supply a **Dead Low Voltage System**, two circumstances **Shall** be considered.

- Where the **System** could already be **Dead** due to a fault; and
- Where the **System** is still **Live** and will only be de-energised for a short period of time prior to closing the **Generator Low Voltage** circuit-breaker

12.6.2 For connections to **Dead** three-phase **Systems** the phase rotation **Shall**, where practicable, be checked at the intake position prior to disconnecting from the normal **System** supply and again after re-supplying the **System** from the **Generator**. If this is not practicable, then all three-phase equipment on the **System Shall** be isolated and, with the **Generator** connected, the phase rotation **Shall** be confirmed within an installation prior to energising any three-phase equipment and confirming correct operation.

12.6.3 For single-phase installations the polarity of the supply from the **Generator Shall** be checked at the point of connection.

12.6.4 Preliminary **Switching** should be carried out and warning notices should be posted at all interconnection points between other **Low Voltage Systems** and the section to be supplied by the **Generator**.

12.6.5 If applicable, the load current should be measured and, where necessary, steps should be taken to section the load being connected to the **Generator** to ensure that any step load does not exceed 50% of the **Generator** rated power output. For example: when connecting a **Generator** to a ground-mounted substation, it could be necessary to connect the load one feeder at a time.

12.6.6 During loading, the voltage and frequency should be monitored to ensure they remain within the statutory limits.

12.7 Parallel Operation

12.7.1 If a **Generator** is to remain connected in parallel with a **Low Voltage System**, the operator **Shall** ensure that the G59 / G99 or “loss of mains” **Protection** is switched on.

12.7.2 As **Generators** are normally connected in parallel with a **Low Voltage System** for voltage support, the **Generator** should be loaded to not more than 80% of the **Generator** rated power output. This will allow the **Generator** a safety margin within which it can operate and accept some additional load due to frequency shifts on the **Low Voltage System**. Care **Shall** also be taken to ensure that any Reactive Power (VArs) are minimised. Failure to do so could result in alternator failure due to overheating.

12.7.3 Any power factor correction equipment or large motors on the **Low Voltage System Shall** be disconnected or remain switched-off during the time the **Generator** is in use.

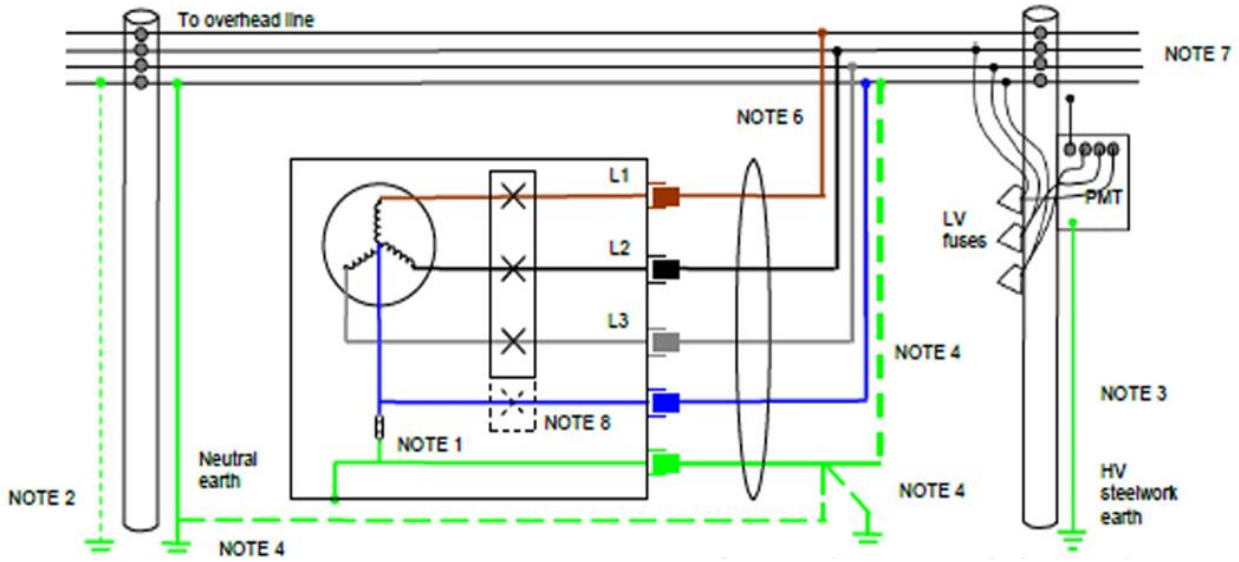
12.7.4 Only non-isochronous **Generators** should be used for sustained parallel running.

13 Revision History

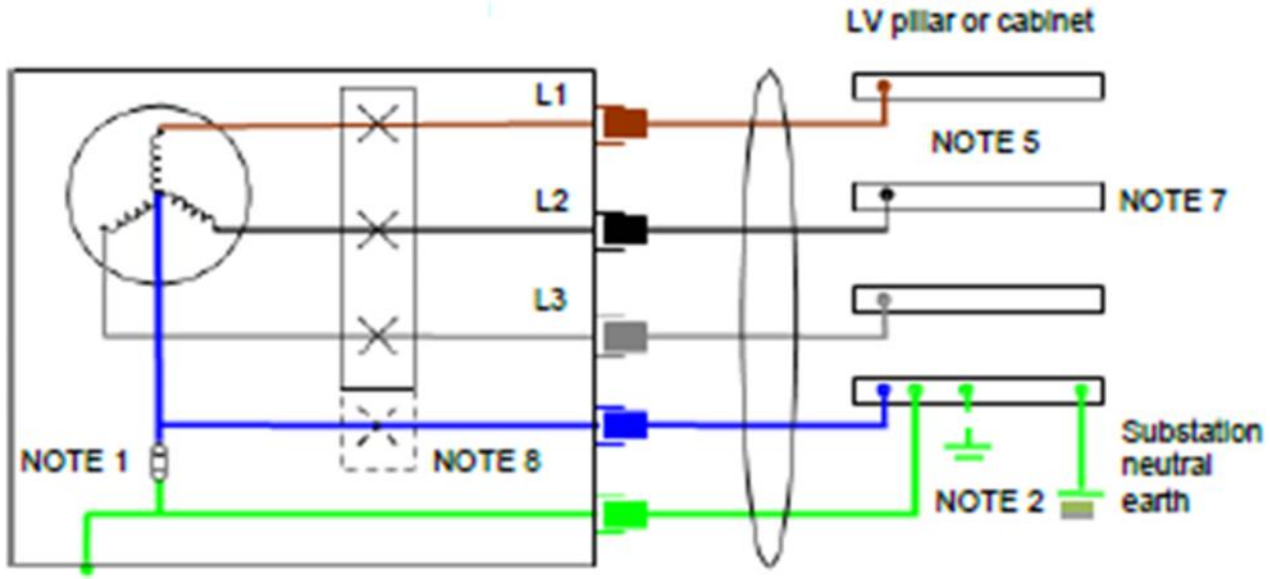
No	Overview of Amendments	Previous Document	Revision	Authorisation
01	New document created	TBC	1.00	Richard Gough
02				

Appendix A Typical Arrangements

Connection to Overhead Line

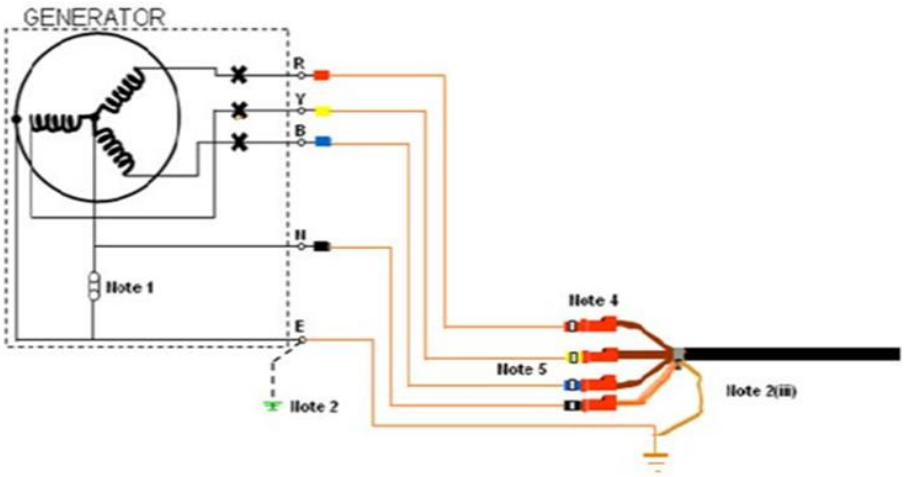


Connection to Ground Mounted Substation

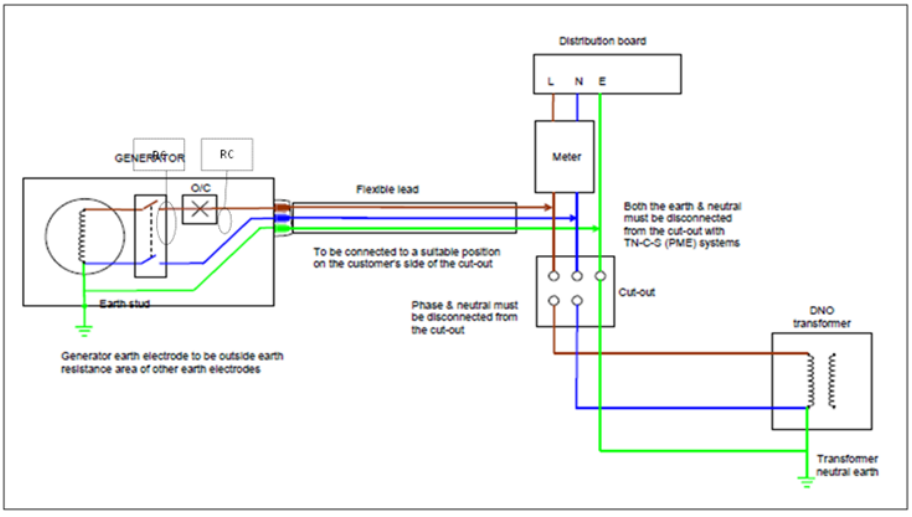


Note 1	Link between **Generator** chassis and neutral to be connected
Note 2	Provide additional neutral **Earth** rod if work may disconnect normal neutral **Earth** connection
Note 3	**Generator Earth** lead must be connected to **LV** neutral. It must not be connected to the **HV** steel-work **Earth** at either ground mounted or pole mounted transformers.
Note 4	Preferred connection for generator **Earth** lead on overhead systems is to neutral **Earth** connection. If not accessible then connect to neutral conductor and install additional rod.
Note 5	**Approved** busbar or feeder stalk connections to be used to connect **LV** pillar or cabinet.
Note 6	Connection to open wire **LV** lines to be direct onto the line or to **LV** pole fuses using **Approved** connectors. An alternative for ABC lines is to permanently connect a short length of ABC down the pole and connect to the ends; these must be left with removable insulation after use.
Note 7	Network phase rotation may not be shown.
Note 8	Choice of 3 or 4 pole circuit breaker based on assessment of criteria in ENA EREC G84 section 8.2

Connection to Underground LV Mains



Small Portable Generators



Appendix B Power Lock Connectors

All **SSEN-D** and some hired **Generators** use Power Lock connectors to connect the leads to the **Generator**, to each other, or to connectors. These comprise a range of plug and socket connectors, which are:

- Colour coded and individually keyed to prevent cross connection
- Locked together when mated, needing a tool to disconnect
- Water resistant, but not waterproof, when mated

Appendix C On Site Refuelling of Generators

1. The requirement to refuel a **Generator** on-site should be reduced, as far as practicable, by minimising periods of operation, requesting **Generators** with larger fuel tanks, or using separate on-site bulk fuel tanks.

2. Any on site fuel tanks **Shall** be bonded to the **Generator Earth**.

3. If due to the length of time a **Generator** will be running it will be necessary to refuel the **Generator** on more than two occasions, then a Risk Assessment **Shall** be made as to whether an extended running tank should be used to decrease the risk of fuel spillage during multiple refuelling.

4. If on-site refuelling is required, the following conditions **Shall** apply:

   - All transportation of fuel **Shall** comply with the current Carriage of Dangerous Goods Regulations, as detailed in PR-NET-OCS-006
   - Wherever possible, fuel **Shall** only be transported in Intermediate Bulk Containers, road tankers or similar
   - An oil spill response kit **Shall** be available on site during refuelling operations
   - The operator **Shall** have been trained in the refuelling procedure, which also specifies the requirements for deploying any oil response material before refuelling starts based on the Environmental Risk Assessment
   - Refuelling can be carried out by one person using powered pumps, providing all the following conditions are met:
     - The fuel delivery nozzle **Shall** be fitted with automatic shut-off valves, which Shall be in working order
     - The delivery nozzle **Shall** operate on a "dead man" principal and **Shall** not be fitted with any means of keeping the delivery valve handle in the open position
     - The operative **Shall** be able to see the **Generator** fuel tank sight glass / gauge from the tank filling point and have easy access to any shut-off valve on the refuelling tank
     - The operator **Shall** check the fuel delivery hose is free from defects or leaks before commencing refuelling

5. If any one of the above conditions cannot be met, or if refuelling is done by means of hand-operated pumps, the refuelling must be carried out by two people.

6. When refuelling:

   1) Before leaving the Depot carry out the normal vehicle safety checks, including fire extinguishers and ensure the oil spill response kit is complete. Replace any missing items
   2) Park as close to the **Generator** as practicable but with consideration for the safety of other road users. Use warning beacons and/or road signs as required
   3) Check the **Generator** is operating normally and there are no signs of interference
   4) Always place oil spill absorbent material down at the fill point of the **Generator** to catch any spillage
   5) Check the spill response kit is readily accessible
   6) Run out the refuelling hose to the **Generator**

7) Check you can determine the fuel tank level to avoid overfilling

8) Start the bowser pump and commence refuelling

9) Do not jam the nozzle trigger in any way and never leave the filling point unattended

10) When refuelling has been completed, stow away the hose. Recover the oil spill absorbent material and confirm the site is clean

11) Where automatic engine lube gear is fitted to the **Generator**, check and top up conservator tank as required

12) Advise the **Generator** Booking team of any abnormalities

13) Connect the **Low Voltage** supply to input side of **Hybrid Generator** and switch on to charge battery and keep charged, if required